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AUTHOR Catsambis, Sophia; Beveridge, Andrew A.
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ABSTRACT

This study examines how neighborhoods, schools, and families can influence the mathematics achievement of eighth graders, using data from the 1988 National Educational Longitudinal Study combined with U.S. Census data. These data allow simultaneous analysis of all aspects of students' lives. Results indicate that there are associations between family, neighborhood, school on the one hand and mathematics achievement on the other. Neighborhoods characterized by concentrated disadvantage and schools characterized by student poverty and absenteeism tend to depress students' mathematics achievement. Characteristics of disadvantaged neighborhoods tend to influence mathematics achievement indirectly by depressing parental practices associated with high mathematics achievement. The social context of these neighborhoods may depress parents' abilities to engage in effective parental practices and may foster social contexts that are not supportive of academic pursuits for adolescents. The study concludes that place of residence may have important consequences for the academic success and resulting life chances of adolescent. It may affect minority students the most because they are concentrated in inner-city, disadvantaged neighborhoods. To a certain extent, parents can help students overcome the educational disadvantages of their environments by communicating with them frequently, closely monitoring their activities, and providing extra learning opportunities. (Contains 58 references.) (SM)

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CRESPAR

NEIGHBORHOOD AND SCHOOL INFLUENCES ON THE FAMILY LIFE AND MATHEMATICS PERFORMANCE OF EIGHTH-GRADE STUDENTS

Sophia Catsambis
Andrew A. Beveridge

Report No. 54 / October 2001

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CENTER FOR RESEARCH ON THE EDUCATION OF STUDENTS PLACED AT RISK

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Sophia Catsambis
Queens College and the Graduate Center of CUNY

Andrew A. Beveridge
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THE CENTER

Every child has the capacity to succeed in school and in life. Yet far too many children, especially those from poor and minority families, are placed at risk by school practices that are based on a sorting paradigm in which some students receive high-expectations instruction while the rest are relegated to lower quality education and lower quality futures. The sorting perspective must be replaced by a "talent development" model that asserts that all children are capable of succeeding in a rich and demanding curriculum with appropriate assistance and support.

The mission of the Center for Research on the Education of Students Placed At Risk (CRESPAR) is to conduct the research, development, evaluation, and dissemination needed to transform schooling for students placed at risk. The work of the Center is guided by three central themes—ensuring the success of all students at key development points, building on students' personal and cultural assets, and scaling up effective programs—and conducted through research and development programs in the areas of early and elementary studies; middle and high school studies; school, family, and community partnerships; and systemic supports for school reform, as well as a program of institutional activities.

CRESPAR is organized as a partnership of Johns Hopkins University and Howard University, and supported by the National Institute on the Education of At-Risk Students (At-Risk Institute), one of five institutes created by the Educational Research, Development, Dissemination and Improvement Act of 1994 and located within the Office of Educational Research and Improvement (OERI) at the U.S. Department of Education. The At-Risk Institute supports a range of research and development activities designed to improve the education of students at risk of educational failure because of limited English proficiency, poverty, race, geographic location, or economic disadvantage.

ABSTRACT

In this report we explore ways by which neighborhoods and schools can influence the mathematics achievement of eighth grade students. We use data from the National Educational Longitudinal Study (NELS:88) and combine it with U.S. census data at the level of students' residential zip codes. These data allow us to simultaneously analyze, for the first time, all aspects of students' lives—their families, neighborhoods, and schools.

We propose and find evidence that disadvantages at the neighborhood and school level may place students at risk through a twofold process. First, neighborhood and school characteristics may influence students and their achievement in mathematics. Neighborhoods characterized by concentrated disadvantage and schools characterized by high levels of student poverty and student absenteeism are associated with lower levels of mathematics achievement, net of individual-level background controls. Second, neighborhoods may also affect students' mathematics achievement indirectly by influencing parents' ability to help children succeed in school. Net of individual-level background controls, neighborhood characteristics are associated with five out of our seven indicators of parental involvement, while neighborhood disadvantage mediates the impact of social class background for all parental involvement indicators. Neighborhood characteristics also mediate the impact of some parental involvement indicators on students' mathematics achievement. Parents may be able to overcome, to some degree, neighborhood disadvantages by frequently communicating with their children, closely monitoring their activities, and providing extra learning opportunities for them.

These findings lead us to believe that "bringing neighborhood in" makes sense for this line of research. Even with the inherent limitations in using zip codes as neighborhoods, it is plain from our present analyses that neighborhood characteristics along with student/family and school level variables explain some of the differences in the types of parental involvement and their effectiveness, and in mathematics achievement.

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INTRODUCTION

Current research in the sociology of education seeks to explain underachievement among disadvantaged students, especially those at risk, by focusing on the individual characteristics of students and their families. This framework of individual-level analyses makes it practically impossible to investigate any impact that the social structure may have on the academic performance of disadvantaged students (Wilson, 1998). According to W.J. Wilson (1998), the challenge for social scientists is to develop new frameworks that consider the complex interrelationships between individual behaviors and social-structural characteristics, especially those that capture structured social inequality. Such frameworks would make possible more complete investigations of environmental influences on educational outcomes.

Recent methodological developments and a renewed interest in neighborhood studies have advanced research on the influence of social context on individual behaviors, such as crime, deviance, adolescent behaviors, and educational outcomes (Brooks-Gunn, Duncan, & Aber, 1997a, 1997b; Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Crane, 1991; Duncan, 1994; Sampson & Raudenbush, 1999; Sampson, Raudenbush, & Earls, 1997). One recent study on disadvantaged neighborhoods elucidates the process by which such neighborhoods may have a negative impact on their residents. They tend to depress collective efficacy, and give rise to social disorder and crime (Sampson & Raudenbush, 1999). We reason that the low levels of collective efficacy of disadvantaged neighborhoods may pose constraints on the educational activities that parents can adopt, or may weaken parental efforts to support children's academic success. These processes could result in lower levels of academic achievement of minority and poor adolescents. Thus, our report seeks to extend this line of work by investigating the process by which neighborhood context can influence students' academic success.

Unlike most existing studies which focus on direct influences of neighborhood characteristics on student achievement, our study proposes that the process by which neighborhoods influence students may be twofold. We expect that neighborhood (1) may influence students and their academic achievement directly, and (2) may affect students' academic achievement indirectly through its influence on parental practices that lead to positive student outcomes. We base these expectations on recent findings of a study of Philadelphia city neighborhoods, which suggests that parents may adjust some of their family practices on the basis of their neighborhood circumstances (Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999).

The recent addition of student's residential location to the National Educational Longitudinal Study (NELS:88) make it possible to explore our proposed twofold process. The NELS:88 is a particularly suitable data set for this research because it provides data of early adolescents, an appropriate age to study neighborhood influences on parenting. During adolescence parents begin to provide opportunities for children to make independent decisions. This process is likely to be much easier in a neighborhood that has accessible programs for youth and relatively few dangers (Furstenberg, Cook, Eccles,

Elder, & Sameroff, 1999). To explore this possibility we combined data from the eighth grade survey of students, their parents, and schools of the NELS:88 with the zip codes of students' residence. This allowed us to incorporate data from the U.S. Census regarding neighborhood socioeconomic characteristics and quality of neighborhood life. Using these data sources, our study aims to nationally assess, for the first time, the extent to which students and parents can overcome disadvantages in the family's external environment that constrain academic success. As our results show, neighborhood composition does affect our measure of educational outcome (math achievement). Neighborhood characteristics are associated with eighth grade math achievement directly, and indirectly by structuring parental involvement in children's education and by attenuating its positive relationship with mathematics achievement. Neighborhood characteristics also mediate the relationships between social background characteristics and mathematics achievement. We conclude that interrelationships between family, neighborhood, and school can affect the life chances of adolescents.

Overlapping Spheres of Influence: Family, Neighborhood and School

In addressing Wilson's (1998) challenge to investigate social structural influences on student academic success, we follow a theoretical perspective that considers neighborhood, family, and school as dynamically interacting spheres of educational influence (Epstein, 1992, 1995). We explore ways by which interrelationships between these three spheres of life may influence educational outcomes of students, especially in disadvantaged neighborhoods. We begin with a discussion of each sphere of life and continue with a synthesis that formulates our research questions.

Neighborhood. Educational research rarely explores the potential interrelationships between characteristics of families, neighborhoods, and schools that may affect individual student outcomes. Research in the field of social demography provides leads for investigating those types of interrelationships, especially as they affect the educational outcomes of disadvantaged students. Wilson's (1987) theory on the social transformation of inner cities into areas of concentrated disadvantage inspired Ricketts and Sawhill's (1986) work on "underclass areas." This in turn prompted a significant amount of research on the characteristics and potential effects of disadvantaged neighborhoods (Aneshensel & Sucoff, 1996; Brooks-Gunn et al., 1997a, 1997b; Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Crane, 1991; Simcha-Fagan & Schwartz, 1986). In addition to socioeconomic disadvantage, the poorest neighborhoods tend to experience institutional disinvestment and to have higher rates of racial isolation, unemployment, residential instability, financial dependence, and female-headed households (Sampson, 2000; Wilson, 1987). These characteristics constitute an "ecological concentration of disadvantage." They are linked to a number of educational and behavioral outcomes, including infant mortality, teenage childbearing, low academic achievement, educational failure and delinquency (Ainsworth-Darnell, 1999; Brooks-Gunn et al., 1997a; Duncan, 1994; Sampson, 2000). The reasons why the social context of disadvantaged neighborhoods can influence adolescent behaviors include high incidence of undesirable behaviors (Crane, 1991), low quality or scarcity of local

organizations such as high-quality schools and recreation centers (Bryk, Lee, & Holland, 1993, McLaughlin, Irby, & Langman, 1994), or low levels of social control in public space (Bursik & Grasmik, 1993; Hunter, 1985). Recent research of urban neighborhoods, which capitalizes on new statistical techniques of Hierarchical Linear Modeling and new data collection methods of systematic observation, elucidates the processes by which neighborhood context influences social behavior (Sampson & Raudenbush, 1999; Sampson et al., 1997). Studying Chicago neighborhoods, Sampson, Raudenbush, and Earls (1997) identify collective efficacy as a salient characteristic of neighborhood context. It refers to mutual trust and a shared willingness on the part of the neighborhood residents to intervene for the "common good." Collective efficacy is also linked to the strength of neighborhood organizations and to their ability to secure additional resources and services that sustain the neighborhood's social stability and social control (Sampson, 2000). Neighborhoods characterized by concentrated disadvantage tend to have low levels of collective efficacy, which then lead to social disorder, deviance and crime (Sampson & Raudenbush, 1999). Therefore, the social context of many poor, inner city neighborhoods may constitute a source of behavioral risk and an educational disadvantage for adolescents. Minority groups, such as African Americans and Latinos, are particularly vulnerable to neighborhood disadvantage because they are more likely to be segregated in disadvantaged neighborhoods than White groups (Dornbush, Ritter, & Steinberg, 1991; Massey & Denton, 1993; Slaughter & Epps, 1987). White and minority adolescents living in more advantaged neighborhoods may benefit from readily available positive adult role models, peers with high educational aspirations, and neighborhood or community organizations, including high-quality schools (Brooks-Gunn et al., 1997a).

Disadvantaged neighborhoods may also pose constraints on parents' ability to adopt effective parental practices. Sampson and Raudenbush (1999) suggest that low levels of collective efficacy, limited resources and a high concentration of children in single-parent families may add additional difficulties to the tasks of supervising children and adolescent peer groups. Few studies have actually explored neighborhood influences on parental practices regarding children's education. Large numbers of poverty households affect the quality of learning environments at home (Brooks-Gunn et al., 1997a) and high levels of residential segregation reduce the positive influence of family advantages on the academic achievement of African Americans (Dornbush et al., 1991). The potential advantages of living in a neighborhood with high collective efficacy is supported by a study which found that successful African American students had mothers who experienced less social isolation in their communities (Slaughter & Epps, 1987).

A more recent study of neighborhoods in Philadelphia found evidence that some parental practices vary by neighborhood, but no evidence that neighborhood characteristics reduce the impact of these parental practices on student outcomes. However, these weak findings could be attributed to the small sample size of the study, which also excluded the least and most affluent neighborhoods of the city (Furstenberg et al., 1999). We expect that it is exactly these neighborhoods with extreme characteristics, and especially the most disadvantaged neighborhoods, that could have the strongest impact on their residents (Mayer & Jencks, 1989). Use of the NELS:88 data set, which is based on a large national sample and has high variability in neighborhood composition,

could allow for a more complete investigation of neighborhood effects. We are therefore able to explore the question: Does the social disorganization and lack of resources of the neighborhoods where many disadvantaged families reside undermine students' educational opportunities and parental efforts for children's educational success?

Family. Parental involvement in children's education is one of the major ways by which families influence the educational achievement of children. In order to address adolescents' developmental and educational needs, families adopt a number of practices, which have varying degrees of effectiveness (Lareau, 1989; Muller, 1995, 1998). Positive parental practices for middle grade students include high parental educational aspirations for children, monitoring adolescent behavior at home, frequent parent-teen discussions about school and future education, and parental participation in school governance (Astone & McLanahan, 1991; Ho & Willms, 1996; Keith, Keith, Troutman, Bickley, Trivette, & Singh, 1993; Muller, 1995, 1998; Singh, Bickley, Trivette, Keith, Keith, & Anderson, 1995).

Researchers have linked parental involvement with parents' characteristics, such as their socioeconomic status (SES) and race or ethnic background. Parents of different SES backgrounds engage in different types of educational activities. The activities of higher SES parents are more effective than are those of lower SES parents (Baker & Stevenson, 1986; Lareau, 1989; Lee, 1995; Muller & Kerbow, 1993; Stevenson & Baker, 1987; Useem, 1992). Although there are socioeconomic and race or ethnic differences in some parental practices, poor and minority parents have high educational aspirations and high levels of behavioral supervision for adolescents (Catsambis & Garland, 1997; Ho & Willms, 1996; Muller & Kerbow, 1993). Unfortunately, their efforts to promote academic success are not as effective as similar efforts of White and middle class parents (Lareau, 1989; Useem, 1992).

These research findings leave open the possibility that social structural factors may shape family educational practices and their effectiveness on students' academic success. Thus, is it possible that disruptive neighborhoods and ineffective schools impede the smooth functioning of disadvantaged families and place their adolescents at risk? We explore this possibility in our report.

School. Most of the early research investigating neighborhood influences has focused on the impact of schools. It has implicitly assumed that neighborhoods influence educational outcomes primarily though the quality of available schools (Mayer & Jencks, 1989). Our research however, seeks to distinguish possible influences of neighborhood characteristics that are distinct from those of schools. We identify a few social and organizational characteristics of schools that primarily distinguish inner-city schools. These are linked to student differences in educational success. We include those types of school characteristics in our research, seeking to distinguish the influences of these two distinct but interrelated social domains. Researchers have linked a number of factors to student success, including (a) high rates of racial and ethnic segregation (Wells & Crain, 1994) which is especially evident in inner-city schools (Orfield, Bachmeier, James, & Eitle, 1996); (b) the school's size (Lee & Smith, 1993), and (c) the school's social climate, as defined by the nature of peer groups, school personnel, and educational programs

(Bryk, Lee, & Holland, 1993; Lee & Smith, 1993, 1995; Lee, Smith, & Croninger, 1997). The racial segregation of the student body, the less rigorous academic climate, and the large size of many inner-city schools may place students at an educational disadvantage.

Research on the possible links between schools, family practices, and student achievement is very sparse. So far, little is known about whether schools shape the processes by which parents transmit educational advantages to their children. A few existing studies report that school characteristics influence in-school parent activities (Ho & Willms, 1996; Hoover-Dempsey, Bassler, & Brissie, 1987). In analyses of the NELS:88 data, Ho and Willms (1996) found that parents were more likely to participate in parent-teacher organizations and to volunteer at school if their children attended schools of high socioeconomic background. In addition, some research findings suggest that the social context of the school may mediate the positive relationship between parental involvement and student achievement. Associating with peers that reject the school's values tends to undermine minority parents' efforts to improve adolescents' academic success (Shields & Shaver, 1991; Steinberg, Dornbusch, & Brown, 1992). Is it possible that school characteristics that influence students' academic performance can also influence parents' educational involvement and mediate its relationship with student performance?

Research Synthesis

We expect that the social characteristics of neighborhoods and schools can either facilitate or frustrate both student academic achievement and positive parenting practices. Living in "high-risk" neighborhoods with high levels of concentrated disadvantage and limited social resources may depress student achievement. In addition, parents in such neighborhoods may be forced to expend more effort supervising their adolescents to prevent them from getting into harm's way. Because such neighborhoods have low levels of collective efficacy and high levels of social disorder and crime, adolescents may be further "at risk." Adolescents whose parents do not supervise their activities may experience other negative outcomes.

We also expect that high-risk neighborhoods may counteract parental efforts to positively influence adolescents' behaviors and achievements. These neighborhoods are also populated by other families who have "at risk" students and who may create anti-school peer cultures. The peer cultures and other characteristics of high-risk neighborhoods may undermine parental efforts by negatively influencing adolescent behavior directly. Therefore, the effect of positive parental interventions, such as supervisory activities at home and high parental aspirations, may be much weaker in "high risk" neighborhoods.

To investigate the joint and overlapping effects of neighborhood, family, and school on student's mathematics achievement, we formulate the following research questions:

- Do neighborhoods and schools influence the patterns of parental practices with eighth graders' education?

- In what ways do parental educational practices, neighborhood and school influence student's achievement in the eighth grade?

DATA AND METHODS OF ANALYSIS

Data Sources

We use data from the base year student, parent, and school administrator surveys of the *National Educational Longitudinal Study* of 1988 (NELS:88). This is the most complete, nationally representative, longitudinal data set of secondary school students and consists of a sample of 24,500 eighth graders from 1,052 schools. Several features make the NELS:88 data set appropriate for this investigation. They include adequate within-school samples of students for hierarchical modeling, adequate samples of neighborhoods with a high degree of variability in their characteristics, over-sampling of minority and poverty students and schools, and extensive parental questionnaires. We use a special restricted file of student zip codes, which gives a new dimension to the NELS:88 data set and makes our research possible. This file includes census variables for each zip code, which we use to derive information on the social characteristics of students' neighborhoods. We use zip codes as our proxy for neighborhoods. There are about 35,000 zip codes in the United States; of these, approximately 2,500 are in our NELS:88 sample. We recognize that zip codes are not ideal indicators of neighborhoods. A preferred measure would be census tract, of which there are about 50,000 in the United States. Census tracts are smaller than zip codes and have roughly 4,000 people in them. Unfortunately, only zip code data are available for the NELS:88. Zip codes tend to be small geographically and relatively homogenous in densely populated areas, but are more imprecise in less populated areas, particularly suburbs. Despite these difficulties of our neighborhood indicator, other features of the NELS data set, especially its high variability in neighborhood context, offer unique advantages for this research. Furthermore, the cluster sizes for zip codes generally are large enough to warrant use of hierarchical models. We reason that this imperfect measure of neighborhoods would produce very conservative estimates of neighborhood effect.[1] Data analyses are restricted to students attending public schools.[2]

Variables Used

In the first part of our analysis, we use independent variables measured at the individual, neighborhood, and school level to predict a number of indicators of parental involvement. In the second part, we use these parental involvement indicators together with our additional independent variables to predict students' achievement in mathematics. Appendix A provides descriptive statistics for all of our variables.

Dependent Variables

1. ***Parental Involvement*** in children's education (NELS:88 parent survey). We use seven indicators of parental involvement to capture, as much as possible, the educational activities in the three spheres of life—family, neighborhood, and school.

   a) *Parental Educational Expectations* refer to how far in school the parent expects his or her eighth grader to go (ranging from less than high school to advanced graduate degree).

   b) *Parental Activities at Home* are measured by two indicators: 1) parent-child communication about school (an additive measure of how often the parent talks to the child about school experiences, plans for high school, and plans for college); and 2) parental supervision (an additive measure of family rules regarding student's maintaining a certain grade average, doing homework, and doing household chores).

   c) *Parent-School Contacts* are measured by two indicators: 1) the frequency of parents' contacting the school about their child (regarding his/her academic performance, behavior, school records, and academic program for the year); and 2) parents' participation in school governance (membership in parent-teacher organizations (PTO) and participation in PTO-sponsored meetings and activities).

   d) *Out-of-School Learning Opportunities* are measured by student's enrollment in private music and dance lessons and their frequency of museum visits (visits to art, science, and history museums).

2. ***Educational achievement*** in the eighth grade (NELS:88 student survey). In the second part of our analyses, our multivariate models predict student achievement. We use mathematics test scores as an indicator of eighth grade achievement. They are part of the test battery that was developed by the Educational Testing Service (see Ingels, Scott, Lindmark, Frankel, & Myers, 1992). We focused this study on mathematics because it is a core academic subject and high achievement predicts further educational attainment[3] (Adelman, 1999).

Independent Variables

1. ***Individual-level Characteristics*** (NELS:88 student and parent data)

   a) *Social Background* is measured by student's SES,[4] race/ethnicity (African American, Latino, and White or Asian American), gender, and mother's work status (working full-time or not).

   b) *Student School-Related Behaviors* are measured by student's school attendance (a composite index of student reports on frequency of cutting classes, skipping school, and coming late to school) and student's engagement in academic activities (a composite index of student reports on frequency of going to class without homework, books, paper, and pencil).

2. ***Neighborhood Characteristics*** (U.S. Census data)

a) *Neighborhood Disadvantage*. As an indicator of neighborhood quality of life, we created a scale which combines the results from several census variables. The core of these variables are those that were first suggested by Ricketts and Sawhill (1986) as typifying so-called "underclass areas." This measurement approach was systematized by 1990 (see Mincy, Sawhill, & Wolf, 1990). We computed our measures by using census data for zip codes from the 1990 census. They include: percentage of female-headed households; percentage of high school dropouts; percentage of unemployed males; percentage on welfare; and percentage below the poverty level. Since the work of Ricketts and Sawhill, the location and composition of underclass areas have been of intense interest. Indeed, the Social Science Research Council (SSRC) created an "underclass" database to help monitor the impact of such locations (see Kasadra, 1993a; 1993b). We followed the specifications in that database on how to code the variables to typify neighborhoods as "underclass." Despite the objectionable characteristics of the term "underclass," indicators of neighborhood disadvantage drawn from this line of work are still influential. The variables can be defined relatively unambiguously. For instance, the "high school dropout" indicator is the percentage of individuals between 16 and 19, who have not received a high school diploma and are not attending school. Such a variable has the virtue of being easily computable for a geographic unit for which census data are available.

Our scale of neighborhood disadvantage includes three additional variables: percentage of neighborhood residents who rent; percentage who moved in recently; and median household income. The first two variables add the dimension of residential stability, which has been associated with collective efficacy (Sampson & Raudenbush, 1999). The median household income is related to percentage in poverty, but as with percentage of renters, it should be helpful in typifying neighborhoods according to social status. Most high status neighborhoods have high levels of income and high levels of home ownership.[5]

To create the indicator of neighborhood disadvantage, we used all zip codes in the United States and computed percentile scores for all variables. The variables were all coded so that higher numbers mean more disadvantage. We then created an additive scale. A similar approach for creating a scale of neighborhood characteristics was recently used by South and Crowder (1999). We feel that this approach creates a neighborhood index capable of isolating the effects of neighborhoods at the extreme ends of the disadvantage continuum. It is neighborhoods with very high levels of disadvantage that are likely to have a negative impact on a variety of socially desirable behaviors (Crane, 1991).

Table 1 presents the inter-quartile range and the median of the variables that are included in the scale for all zip codes in the United States and for all the zip codes in the NELS:88 data set. The demographic characteristics of the zip codes included in the NELS sample are very close to those of the universe of zip codes in the United States. There are only a couple of exceptions indicating that the zip codes in the NELS sample are slightly

more advantaged in terms of female-headed household and in terms of residential stability. Despite these small differences, the NELS zip codes are highly variable in terms of demographic characteristics, and quite similar to the zip code universe. This allows us to combine the variables into one scale and makes our proposed investigation possible.

b) *Racial/Ethnic Composition.* At the neighborhood level, we computed the percentage of Latinos and the percentage of African Americans. The means and standard deviations of these variables are reported in Table 1.

Table 1. Census Variables in Neighborhood Disadvantage Scale (All Zip Codes and NELS Respondents)

	All United States Zip Codes			NELS Respondent Zip Codes*		
Variable	*Lower Quartile*	*Median*	*Upper Quartile*	*Lower Quartile*	*Median*	*Upper Quartile*
Percent in Poverty	6.3	12.0	17.7	6.9	12.3	19.5
Percent on Welfare	3.8	6.4	10.6	3.5	6.1	10.0
Percent Male Joblessness	25.9	31.6	38.1	26.3	32.8	40.7
Percent High School Dropout	6.0	10.2	15.0	2.8	8.3	14.8
Percent Female Headed Households	13.5	19.0	25.9	9.3	14.7	21.2
Percent Renters	22.2	29.8	39.4	16.6	22.9	31.3
Percent Recent Movers	14.5	18.8	23.5	11.2	15.3	20.3
Median Household Income	$22,163	$27,742	$36,250	$19,984	$24,894	$31,969
Neighborhood Disadvantage Scale	317	441	548	291	392	501

*Weighted by Respondents

3. *School Characteristics* (NELS:88 school data)

a) Social Characteristics of School. Location of school (urban, suburban, rural), percentage of students who are minority, and percentage of students who are eligible for free or reduced-price lunch.

b) Organizational Characteristics of School. Student-teacher ratio and school size (eighth grade enrollment).

c) School Climate. Two composite measures: one indicating whether absenteeism is a problem in the school and a second indicating whether school violence is a problem.

d) Academic Press. A composite of school principals' responses about students' and teachers' morale, whether students are expected to do homework, whether teachers press students to achieve, and whether students place high priority on learning (see Lee, Smith, & Croninger 1997).

The Structure of the Sample and Appropriate Statistical Methods

To correctly estimate school, neighborhood, and individual-level effects, we use Hierarchical Linear Modeling (HLM).[6] The basic structure of the HLMs is determined by the NELS:88 sampling scheme. The NELS:88 is based on a two-stage probability sample, where schools were sampled in the first stage and students within schools in the second stage. Due to this sampling scheme, schools are treated as level 3 of the HLMs. When zip codes are added to the data, they nest within each school. In turn, several students nest within each zip code. Therefore, we estimate three-level HLMs where students are nested in neighborhoods, which then nest in schools.[7]

The NELS:88 yielded a total sample of 19,702 public school eighth graders with valid data. In our HLM analyses, students are considered as level 1 units. The students nest within 798 public schools, with an average of about 23 students per school. The highest number of students per school is 46. Although a few schools have only one student with valid data, less than 5% of the schools have fewer than 15 students. Schools are considered as level 3 in our HLMs.

The addition of zip codes introduces a new level of units, which we consider as level 2 in our HLM analyses. There are 2,540 zip codes, which nest within schools. On the average, there are about seven zip codes per school, with 10% of the schools having only one zip code. The students nest within the zip codes, with an average of about seven students per zip code. The highest number of students per zip code is 12. About 10% of the zip codes have only one student nesting in them. Level 3 (school) and level 2 (zip code) units that have only one case nesting within them would pose a problem for HLM estimations. However, these units are relatively few in both levels so that there is adequate data to estimate three-level hierarchical linear models. Since our interest is looking for the relative contribution of variables at each of the three levels, we chose to grand-mean center all independent variables. All variables were standardized, so that their coefficients would be in common units and could be interpreted as effect sizes.

Data Analyses

Neighborhood and School Variation in Parents' Educational Practices

We begin our analysis by exploring neighborhood and school variation in our indicators of parental involvement. As we discussed in our introductory section, the literature on neighborhood effects leaves open the possibility that parents may tailor their family activities according to the social climate and available resources of their neighborhood. Our data analyses utilize, for the first time, a full national sample to explore such possibilities. We expect that our neighborhood findings will be fairly conservative because our measure of neighborhood does not coincide with the social boundaries of neighborhoods.

To investigate neighborhood variation in parental practices, we fit an unconditional means HLM for each of the parental involvement indicators. These models include only the

intercepts at the neighborhood level (level 2) and at the school level (level 3), and examine variation in each of the involvement indicators across these two levels.

The variance components estimates for neighborhood and school have small values;[8] this is not surprising, given our measure of neighborhood. It is quite noteworthy, however, that these estimates are all statistically significant and show that consistent clustering exists in the variance of all parental involvement indicators by both neighborhood and school. The most variation by neighborhood and school occurs in the family practices that involve parental and/or children's activities outside the home.

Table 2. Variance Components Analysis of Parental Involvement Indicators

	Expectation of Further Education		Academic Communication		Academic/Behavioral Supervision	
	Parameter	Std Err	Parameter	Std Err	Parameter	Std Err
BASE MODEL						
Level 3						
School Estimate Intercept	0.534****	0.056	0.050****	0.011	0.009***	0.002
Ratio	0.070		0.019		0.016	
Level 2						
Zipcode Estimate Intercept	0.359****	0.054	0.070****	0.015	0.018****	0.003
Ratio	0.047		0.026		0.032	
Residual Estimate (Within Zip)	7.622****	0.084	2.697****	0.030	0.550****	0.006
Ratio	1.000		1.000		1.000	
Level 1						
Intercept	8.405****	0.036	10.280****	0.016	2.551****	0.007

	Parent-School Contacts				Out-of-School Learning Opportunities			
	Communication with School		Participation in PTO		Music/Dance Lessons		Museum Visits	
	Parameter	Std Err	Parameter	Std Err	Parameter	Std Err	Parameter	Std Err
BASE MODEL								
Level 3								
School Estimate Intercept	0.157****	0.022	0.121****	0.011	0.017****	0.003	0.129****	0.013
Ratio	0.040		0.128		0.051		0.096	
Level 2								
Zipcode Estimate Intercept	0.189****	0.027	0.074****	0.009	0.032****	0.003	0.117****	0.012
Ratio	0.048		0.078		0.097		0.087	
Residual Estimate (Within Zip)	3.971****	0.044	0.939****	0.010	0.330****	0.004	1.340****	0.015
Ratio	1.000		1.000		1.000		1.000	
Level 1								
Intercept	5.982****	0.023	0.818****	0.016	0.366****	0.008	1.395****	0.018

**** p<.0001; *** p<.001; ** p<.01; * p<.05

Considering the clustering of variation in parental involvement by school, we observe that the strongest clustering occurs in PTO participation. Variation in levels of PTO participation between schools is 12.8% of the variance in PTO participation between individual parents (ratio of .128). Second in strength of clustering by school is museum visits, followed by expectations for further education. Variation in parent/school communication and music and dance lessons clusters by school as well.

Clustering of variance in parental involvement by neighborhood is slightly stronger than the clustering by school in four out of the seven involvement indicators. The strongest clustering by neighborhood is observed for out-of school learning opportunities (music and dance lessons and museum visits), followed by PTO participation.

Less variation by either neighborhood or school occurs in types of involvement that are related to home activities (academic communication with children and supervision of children). Nevertheless, variation in parent-child home activities tends to show slightly stronger clustering by neighborhood than by school, leaving open the possibility that neighborhood characteristics might shape the parenting practices that families engage in. Is it possible that in high-risk neighborhoods parents will spend more time and effort supervising children's activities than comparable parents who live in safer environments?[9] Our next set of analyses tests for such possibilities.

Relationships between Individual, Neighborhood and School Characteristics and Parents' Educational Practices

For each indicator of parental involvement, we run full models with independent variables at the individual, neighborhood, and school levels. In these models, all independent variables are treated as fixed effects, meaning that their effects on parental involvement are not allowed to vary by neighborhood or school. The full models also include interaction terms between the neighborhood disadvantage index and individual-level characteristics (SES and African American).[10]

We first compare the neighborhood and school variance estimates of the base models in Table 2 with the full models in Tables 3 and 4. They show that when school-level variables are introduced, variation by school is substantially reduced for most indicators of involvement. The exceptions are for parental activities at home, but such parental practices show little school variation to begin with. The full models reduce neighborhood variation in parental educational expectations and out-of-school learning opportunities. However, they explain little neighborhood variation for parent activities at home and parent-school contacts.

The results in Tables 3 and 4 provide a full picture of the characteristics of students, their families, neighborhoods, and schools that are associated with the different parental educational practices. At the individual level, a number of variables have statistically significant coefficients showing that social background characteristics have the strongest effects on parental educational practices. Socioeconomic status (SES) and being

Table 3. Three Level Hierarchical Analysis of Parental Expectations and Home Activities

	Expectation of Further Education		Academic Communication		Academic/Behavioral Supervision	
COMPLETE MODEL						
Random Effects	**Parameter**	**Std Err**	**Parameter**	**Std Err**	**Parameter**	**Std Err**
Level 3						
School Estimate Intercept	0.010****	0.002	0.006****	0.003	0.007**	0.003
Ratio	0.018		0.009		0.010	
Level 2						
Zipcode Estimate Intercept	0.015****	0.003	0.016****	0.004	0.021****	0.004
Ratio	0.026		0.024		0.030	
Residual Estimate (Within Zip)	0.576****	0.006	0.673****	0.007	0.703****	0.008
Ratio	1.000		1.000		1.000	
Fixed Effects						
Level 1						
Intercept	-0.024**	0.008	-0.010	0.008	0.003	0.008
Sex (Male=1)	-0.056****	0.007	0.022**	0.007	0.021**	0.007
Af Amer (Af Amer=1)	0.057****	0.009	0.066****	0.010	0.065****	0.010
Latino (Latino=1)	0.029***	0.008	0.025**	0.008	0.022**	0.009
Mom Works Full-Time	0.005	0.007	0.005	0.007	0.045****	0.008
Socio-Economic Composite	0.399****	0.008	0.216****	0.008	-0.014	0.009
Academic Engagement	0.059****	0.007	0.025***	0.007	-0.019**	0.008
Skips School	-0.074****	0.007	-0.010	0.008	-0.014	0.008
Level 2						
Neighborhood Scale	-0.028*	0.013	0.011	0.013	0.020	0.014
Proportion Non-Latino Af Amer	0.004	0.014	0.033*	0.015	0.007	0.016
Proportion Latino	0.043**	0.015	0.007	0.015	-0.021	0.016
Int: Neigh Scale with SES Comp	-0.044****	0.009			0.050****	0.010
Int: Neigh Scale with Af Amer						
Level 3						
Student Teacher Ratio	-0.004	0.009	-0.019*	0.009	0.007	0.010
% Free or Reduced Fee Lunch	0.004	0.013	-0.011	0.013	0.012	0.013
> 40% Minority	0.052**	0.019	-0.032	0.019	0.015	0.020
School Enrollment	0.056****	0.011	-0.014	0.011	0.030	0.012
Urbanicity	0.002	0.010	-0.014	0.010	0.011	0.011
School Attendance Problems	0.002	0.012	-0.011	0.012	-0.015	0.013
School Violence Problems	0.013	0.011	-0.017	0.011	-0.011	0.012
Academic Press	0.017*	0.009	0.004	0.009	0.013	0.009

**** p<.0001; *** p<.001; ** p<.01; * p<.05

Table 4. Three Level Hierarchical Analysis of Parent-School Contacts and Out-of-School Learning Opportunities

	Parent-School Contacts				Out-of-School Learning Opportunities			
	Communication with School		Participation in PTO Orgs		Music Dance Lessons		Museum Visits	
COMPLETE MODEL								
Level 3	**Parameter**	**Std Err**	**Parameter**	**Std Err**	**Parameter**	**Std Err**	**Parameter**	**Std Err**
School Estimate Intercept	0.017****	0.003	0.049****	0.005	0.008**	0.003	0.025****	0.004
Ratio	0.028		0.088		0.014		0.043	
Level 2								
Zipcode Estimate Intercept	0.031****	0.004	0.040****	0.005	0.038****	0.004	0.038****	0.005
Ratio	0.051		0.072		0.070		0.066	
Residual Estimate	0.602****	0.007	0.555****	0.006	0.541****	0.006	0.582****	0.006
Ratio	1.000		1.000		1.000		1.000	
Fixed Effects								
Level 1								
Intercept	-0.026**	0.009	-0.024*	0.012	-0.024**	0.009	-0.010	0.010
Sex	0.105****	0.007	0.000	0.007	-0.250****	0.007	-0.001	0.007
Af Amer (Af Amer=1)	0.023*	0.011	0.067****	0.011	-0.041****	0.010	-0.019*	0.009
Latino(Latino=1)	0.015	0.008	0.016	0.008	-0.020**	0.008	0.010	0.008
Mom Works Full-Time	0.013	0.007	-0.034****	0.007	-0.023***	0.007	-0.018**	0.007
Socio-Economic Composite	0.133****	0.008	0.244****	0.008	0.282****	0.008	0.270****	0.008
Academic Engagement	-0.065****	0.007	-0.007	0.007	0.001	0.007	0.025***	0.007
Skips School	0.093****	0.007	-0.033****	0.007	-0.011	0.007	-0.025***	0.007
Level 2								
Neighborhood Scale	0.019	0.014	-0.049**	0.016	-0.041**	0.014	-0.054***	0.015
Proportion Non-Latino Af Amer	0.007	0.017	0.058**	0.018	0.000	0.016	-0.009	0.017
Proportion Latino	-0.001	0.017	-0.008	0.019	-0.009	0.016	0.005	0.018
Int: Neigh Scale with SES Comp	0.039****	0.009	-0.030***	0.009	-0.075****	0.009	-0.030***	0.009
Int: Neigh Scale with Af Amer	0.029**	0.011	-0.030**	0.011	0.021*	0.011		
Level 3								
Student Teacher Ratio	0.027*	0.011	-0.004	0.014	0.017	0.010	-0.033**	0.012
% Free or Reduced Fee Lunch	-0.041**	0.015	-0.060***	0.018	-0.024	0.014	-0.032*	0.016
> 40% Minority	0.032	0.021	0.087***	0.025	0.000	0.020	0.072**	0.023
School Enrollment	-0.068****	0.013	-0.068****	0.016	0.014	0.012	0.010	0.014
Urbanicity	-0.042***	0.012	-0.051***	0.015	-0.007	0.011	-0.111****	0.013
School Attendance Problems	-0.026	0.014	0.012	0.018	0.017	0.013	0.007	0.015
School Violence Problems	-0.001	0.013	0.007	0.016	-0.002	0.012	0.008	0.014
Academic Press	-0.009	0.010	0.014	0.013	0.003	0.009	0.000	0.011

**** p<.0001; *** p<.001; ** p<.01; * p<.05

African American are positively related to parental educational expectations and parent-child academic communication. SES is negatively related to academic/behavioral supervision, while being African American has the strongest association with this parental practice. Being African American or Latino is negatively related to providing music and dance lessons. Mothers' work status is associated with some types of parental involvement, with mothers who work full time spending more time supervising their children and less time providing out-of-school learning opportunities or participating in PTOs.

Student characteristics, especially gender, are also associated with the levels of parental involvement. On the one hand, parents have higher educational expectations for their daughters and provide more music and dance lessons for them. On the other hand, parents have somewhat higher levels of academic communication and supervision, and even higher levels of school communication, for their sons. Students' school behaviors have somewhat weaker relationships with parental involvement than their gender, but these relationships show consistent patterns as well. Eighth graders who exhibit positive school behaviors (engagement in academic activities) have parents who have high educational expectations for them, have frequent communication with them regarding school matters, and provide more museum visits for them. Parents of students who are engaged in school spend less time supervising their children's behavior and communicating with the school. Parents of students who show little interest in school (as measured by their incidence of skipping school) have lower educational expectations for them, participate less in PTOs, and provide fewer museum visits. Parents of such students contact the school more often than other parents. Other researchers also report similar types of associations between parental contacts with school and student behaviors or academic achievement. It seems that for middle grade students, parent-school communications indicate parent or school efforts to deal with problems in student behavior or academic performance (Ho & Wilms, 1996; Lee, 1995; Muller, 1993, 1998). Overall, the coefficients of these individual-level variables show that parents of different backgrounds and family conditions tend to get involved in their eighth graders' education in different ways. The types of activities that parents are engaged in tend to be related to the socioeconomic and race/ethnic characteristics of parents and to the child's gender and school-related behaviors.

Neighborhood-level variables show statistically significant coefficients for most of the parental involvement indicators. Although these coefficients tend to be small, they do show a consistent pattern of effects. The most important characteristic associated with parental educational involvement is the index of neighborhood disadvantage. The relationships between neighborhood disadvantage and the different parental practices is not uniform for all parents. Statistically significant interaction terms show that neighborhood characteristics tend to mediate the relationships between parents' socioeconomic background, racial characteristics, and parental practices.

Neighborhood disadvantage is related to decreases in the educational involvement of higher SES parents. The educational expectations for their child, participation in PTOs, and provision of additional learning opportunities of relatively advantaged parents are lower than those of similar parents in more advantaged neighborhoods. Neighborhood disadvantage, however, is associated with increases in higher SES parents'

academic/behavioral supervision and communication with the school. The neighborhood disadvantage is also associated with increases in parent-school communications and provision of music and dance lessons among African American parents. African American parents in disadvantaged neighborhoods have lower PTO participation than their counterparts in more advantaged neighborhoods.

A number of variables measured at the school level have statistically significant coefficients for all indicators of parental involvement. Again, although the magnitude of these coefficients is small, they do show that school characteristics are linked with a number of parental educational practices. Schools that serve economically disadvantaged and minority students, schools that are large, and schools that are located in urban areas seem to influence parental practices the most. Parent's educational expectations, parent-school contacts (communication with the school and PTO participation), and museum visits are the involvement indicators that are related to school characteristics. Large schools and schools serving a high proportion of minority students are linked with lower levels of parent-school contacts. School size seems to be the school characteristic that is most strongly associated with the two indicators of parent-school contacts. School size and percentage minority tend to have positive associations with parental educational expectations, while three school characteristics (student-teacher ratio, student poverty, and urban school environment) have negative associations with museum visits.

Taken together, the results of these multilevel models show that parents' educational involvement with their child is associated with their personal resources and the characteristics of their child. The quality of neighborhood life and the social organization of schools are also related to parents' educational involvement in a variety of ways. The next step in our analysis is to investigate the ways in which the three spheres of life, family, neighborhood, and school, are associated with students' educational success. To do so, we consider the relative strength of the relationships between family characteristics, parental involvement, neighborhood, school, and eighth graders' mathematics achievement.

Relationships between Individual, Neighborhood, and School Characteristics and Students' Mathematics Achievement

Before fitting a multivariate model to predict mathematics achievement, we ran an unconditional means model to estimate the degree of variation in mathematics achievement by neighborhood and school. The results are presented in the first panel of Table 5.

The variance components estimates show that there is a fair amount of clustering of mathematics test scores within schools. This result is very similar to the findings of other researchers who have applied two-level HLMs on the same data set (Bryk & Raudenbush, 1992; Singer, 1998). The results of the three-level model show that in addition to clustering by school, there is also some clustering of mathematics test scores by neighborhood. The

Table 5. Analysis of Mathematics Achievement NELS Base Year. Three Level Hierarchical Linear Model with Student/Family, Parental Involvement, Neighborhood (Zipcode) and School Variables

	Base Model (Intercept Only)		Full Model	
RANDOM EFFECTS				
Level 3	**Parameter**	**Std Error**	**Parameter**	**Std Error**
School Estimate Intercept	16.843***	1.238	3.039***	0.377
Ratio	0.193		0.044	
Level 2				
Zipcode Estimate Intercept	5.187***	0.770	1.463***	0.381
Ratio	0.059		0.021	
Residual	87.417***	0.989	68.463***	0.767
Ratio	1.000		1.000	
FIXED EFFECTS				
Level 1				
Intercept	49.421***	0.174	49.601***	0.103
Sex (Male=1)			0.666***	0.078
Af Amer (Af Amer=1)			-1.834***	0.118
Latino (Latino=1)			-0.715***	0.088
Mom Works Full-Time			-0.213**	0.076
Socio-Economic Composite			2.570***	0.099
Academic Engagement			0.651***	0.077
Skips School			-0.965***	0.080
Parental Involvement Vars				
Expectation of Further Education			3.031***	0.088
Academic Communication			-0.279**	0.083
Academic/Behavioral Supervision			-0.907***	0.077
Communication with School			-1.104***	0.082
Participation in PTO			0.209**	0.084
Music/Dance Lessons			0.778***	0.086
Museum Visits			0.459***	0.083
Level 2				
Neighborhood Scale			-0.439***	0.151
Proportion Non-Latino Af Amer			-0.333	0.177
Proportion Latino			-0.038	0.180
Int: Neigh Scale with SES Comp			-0.482***	0.111
Int: Neigh Scale with Af Amer			0.357**	0.124
Parental Involvement Vars				
Int: Neigh Scale with Expectation of Further Education			-0.928***	0.107
Int: Neigh Scale with Academic Communication			0.284**	0.100
Int: Neigh Scale with Academic/Behavioral Supervision			0.445***	0.097
Int: Neigh Scale with Music/Dance Lessons			0.211*	0.104
Level 3				
Student Teacher Ratio			-0.002	0.120
% Free or Reduced Fee Lunch			-0.649***	0.161
> 40% Minority			-0.194	0.230
School Enrollment			-0.140	0.141
Urbanicity			0.109	0.133
School Attendance Problems			0.419**	0.152
School Violence Problems			0.022	0.143
Academic Press			0.158	0.111

**** p<.0001; *** p<.001; ** p<.01; * p<.05

neighborhood clustering is not nearly as strong as the clustering by school, but it still is noteworthy and statistically significant. Variation within schools comprises about 19% of the individual-level variance (ratio of .193), while variation within neighborhoods comprises about 6% of the individual-level variance (ratio of .059). These results show that a three-level model could be used to explain mathematics achievement.

Coefficients of the three-level multivariate model are presented in the second panel of Table 5. Our full model includes all individual, neighborhood, and school variables that were used in the models predicting the different parental involvement practices, plus all measures of parental involvement and their interaction terms with neighborhood disadvantage.[11] A comparison of the variance estimates of the full models with those of the unconditional means model show that our full model explains most of the school-level variation of math achievement; the school variance estimate drops from 16.84 to 3.08. Our full model also explains most of the neighborhood-level variation, with the neighborhood variance estimate dropping from 5.19 to 1.40.

The full multilevel model confirms the findings of other researchers who used individual-level or individual and school-level analyses to predict student achievement. It also adds some new findings regarding the effects of neighborhoods and schools on eighth graders' mathematics achievement.

Beginning with the effects of individual-level variables, the results of Table 5 reveal that most of the student and family characteristics included in the model have statistically significant coefficients in the expected direction. Minority students, students whose mothers work full time and those who tend to skip school, tend to have lower mathematics test scores. Male students, students of high SES, and students who have somewhat higher levels of academic engagement tend to have higher mathematics test scores.

All indicators of parental involvement have statistically significant coefficients, with the strongest being parental educational expectations. PTO participation and out-of-school learning opportunities are positively associated with mathematics achievement, while parent-school communication is negatively associated with this dependent variable. These relationships are uniform for all students and are not mediated by any of the neighborhood characteristics. The findings for these parental practices corroborate those of previous research (Ho & Willms, 1996; Keith et al., 1993; Muller, 1993, 1995, 1998; Schneider & Coleman, 1993; Singh et al., 1995). As mentioned earlier the negative relationships between academic achievement and parental involvement practices are usually interpreted as attempts to deal with student problems that already exist (Ho & Willms, 1996; Muller, 1993, 1995).

Of our most noteworthy findings are the statistically significant interaction terms between neighborhood characteristics and four parental practices (parental educational expectations, academic communication, parental supervision of the child, and music/dance lessons). Our multilevel model includes three measures of neighborhood characteristics, the disadvantage index, and the percentage of residents who are African American or Latino. The racial and ethnic characteristics of the neighborhood are not related with math

achievement, but the measure of neighborhood characteristics seems to condition, or mediate, the relationships between parental practices, parental demographic characteristics, and students' mathematics achievement. Thus, neighborhood characteristics are linked to mathematics achievement in a variety of ways. The interaction terms between neighborhood disadvantage and parental practices show the following results: the strong positive association between parental educational expectations and mathematics achievement is weakened by negative characteristics of neighborhoods. The negative relationship between academic communication with the child and parental supervision of the child occurs only for those living in advantaged neighborhoods. The sign of this relationship is reversed for students living in disadvantaged neighborhoods; they tend to benefit from such parental practices. Of all the parental involvement indicators, parental supervision has the strongest positive interaction term with neighborhood disadvantage. This indicates that in disadvantaged neighborhoods parental supervision is particularly important for students' academic achievement. Similarly, provision of music and dance lessons is also particularly important for those students living in disadvantaged neighborhoods.

The interaction terms between neighborhood characteristics and students' social background show similar results with those found in the models that predict parental involvement. That is, neighborhood disadvantage is particularly detrimental for students with higher SES backgrounds, while African American students in disadvantaged neighborhoods tend to fare better than students from other racial or ethnic backgrounds.

Finally, of the school-level measures, only two, poverty and absenteeism, show statistically significant coefficients. Students in schools that serve a high proportion of students eligible for free lunch tend to have lower mathematics achievement than similar students in schools serving economically advantaged students. The variable of student absenteeism is reverse coded and its coefficient indicates that students in schools where student attendance is not a problem have higher test scores than similar students in schools where student attendance is sparse.

DISCUSSION

Our report contributes to a growing body of literature that investigates ways by which characteristics of disadvantaged neighborhoods can give rise to a host of problematic social behaviors, including educational failure (e.g., Aneshensel & Sucoff, 1996; Brooks-Gunn et al., 1993; Brooks-Gunn et al., 1997a, 1997b; Crane, 1991; Furstenberg et al., 1999; Sampson, 2000; Sampson & Raudenbush, 1999; Wilson, 1987). Research results within this literature led us to expect that neighborhoods and their schools can affect students and their educational achievements directly, and indirectly through their influence on parental practices. The schools of many disadvantaged neighborhoods have characteristics that are linked to low academic performance (Bryk, Lee, & Holland, 1993; Crane, 1991; Lee & Smith, 1995, 1993; Lee, Smith, & Croninger, 1997; Orfield et al., 1997; Wells & Crain, 1994). The social context of disadvantaged neighborhoods is also linked to low levels of

collective efficacy, which can give rise to social disorder and crime, and limit the availability of neighborhood organizations (Sampson, 2000; Sampson & Raudenbush, 1999). We reasoned that this social environment could directly affect students' academic efforts and opportunities. It could also affect students' achievements indirectly, by limiting parents' abilities to engage in effective family practices.

Our report has discovered associations between family, neighborhood, school, and mathematics achievement. It leaves open the possibility that these three spheres of life may also affect other adolescent behaviors and achievements that may have important implications for the life chances of disadvantaged youth. We focused our research on achievement in mathematics because mastery of this academic subject has important implications for the future accomplishments of adolescents. High mathematics achievement and relevant coursework is one of the most important predictors of students' college attendance and their completion of a bachelor's degree (Adelman, 1999). This relationship between mathematics achievement and future academic success is especially pronounced for African American and Latino students (ibid). Our findings therefore raise the concern that neighborhood and school characteristics may constitute sources of disadvantage that particularly affect the life chances of minority and disadvantaged youth.

We discuss our results with one methodological caveat. When we consider associations between neighborhood characteristics and individual social behaviors, it is difficult to refrain from causal language. We caution the reader that any causal statements we make are only tentative, because of two limitations of our research. First, our study is based on cross-sectional data and therefore direct imputations of causality cannot be supported. Second, because we use zip code as a proxy for neighborhood, the neighborhood coefficients are relatively weak. More refined measures of neighborhood are needed for further investigations of interrelationships between family, neighborhood, and school. Despite these limitations, the overall pattern of our results supports our initial expectations.

Our findings not only support existing research on what factors are related to parents' engagement in different educational practices, but they further clarify these relationships. At the individual level, we first note that parents' educational involvement is related to their child's characteristics and behaviors. Parents tend to have higher educational expectations and involvement for their daughters and for children who show interest in school. Parents' educational practices may also be influenced by their available resources, as defined by their SES, race/ethnicity, and mother's work status. High SES parents have high educational expectations for their children and seek to realize these expectations not so much by supervising children's activities, but rather by having frequent discussions with them about school and by offering additional learning opportunities. The social environment possibly aids these patterns of educational involvement. Living in neighborhoods with few high-risk factors probably reduces the need to closely supervise children's behaviors and may allow parents to spend time in other activities such as

participating in PTOs. At the same time, neighborhood resources can facilitate parents' ability to offer out-of-school learning opportunities.

It is quite noteworthy that parents of higher SES may be affected by the quality of neighborhood life much more than parents of lower SES or minority parents. On the one hand, relatively well-off parents who live in disadvantaged neighborhoods have lower educational expectations for their children and provide fewer extra learning opportunities for them than similar parents in more advantaged neighborhoods. On the other hand, these parents tend to have higher levels of supervision of their child and more communication with both the child and the school than their counterparts who live in more advantaged neighborhoods. Low SES parents, minority parents, and mothers who work full time provide fewer out-of-school learning opportunities, but have high levels of parental activities at home, especially regarding the supervision of student activities.

African American parents may not be as negatively affected by the quality of neighborhood life as parents from other racial or ethnic backgrounds. When faced with a disadvantaged social environment, African Americans seem to mobilize by increasing their contacts with the school and providing more out-of-school lessons for their children. In some instances though, African American parents are also negatively affected by neighborhood characteristics; those living in disadvantaged neighborhoods tend to participate less in PTOs than African Americans living in more advantaged neighborhoods.

Despite the varying reactions that different parents may have when faced with neighborhood disadvantage, the quality of neighborhood life is negatively related with the activities of all parents; it is related to lower participation in PTOs and fewer out-of-school learning opportunities. Further research is needed to investigate whether these parental practices are affected by the paucity of organizational resources or the social disorganization of many disadvantaged neighborhoods. Our findings here support the overall idea that the external social environment of the neighborhood may place limitations on parental efforts to improve the educational opportunities and life chances of adolescents.

Educational activities of poor and minority parents may also be affected by the school environment, since they are most likely to encounter large or urban schools or schools with high proportions of minority and poor students (Orfield et al., 1997). Characteristics that indicate disadvantaged schools are associated with higher levels of child supervision, and surprisingly, with higher levels of parental educational expectations. Since minority status is associated with those parental practices, high concentrations of minority students in the school may produce an added contextual effect. Children and parents in disadvantaged schools may have more opportunities to associate with other parents who have high levels of educational expectations and behavioral supervision of their children. This may boost the educational efforts of individual parents. However, characteristics of disadvantaged schools may negatively affect other types of parental activities, such as educational communication with the school and the child and

participation in PTOs. Therefore, although parents may struggle to help students overcome disadvantages, some organizational features of the school may offset their efforts. These negative effects are not inevitable, however. Recent research and practice has shown that schools can be successful in promoting communication with parents and increasing parent participation in school activities (Simon, 2000; Epstein, 1995).

In investigating the factors that influence students' mathematics achievement, our findings indicate that neighborhoods may influence students' academic achievement in direct and indirect ways. First, neighborhoods may influence student achievement indirectly, by depressing parental practices that are associated with high mathematics achievement. Of the parental involvement practices, educational expectations and out-of-school learning opportunities have the strongest positive associations with mathematics achievement. As noted above, neighborhood disadvantage is linked to parents' lower levels of engagement in these activities. Second, the quality of neighborhood life may affect students' achievement in mathematics in direct ways. Our findings show evidence of direct relationships between neighborhood characteristics and mathematics achievement. The strength and direction of these relationships depends on family characteristics and parental practices. The overall negative effect of neighborhood disadvantage on mathematics achievement is particularly strong for families of higher SES. Neighborhood characteristics tend to weaken the strong positive relationship between SES and mathematics achievement. Similarly, the strong relationship between parental educational expectations and student achievement is weakened by neighborhood disadvantage.

Despite the potential risks associated with social context, our data show that some parents and students are able to overcome, to a certain degree, the pitfalls of living in a high-risk neighborhood. These findings add yet another layer of complexity to the emergent relationship between concentrated disadvantage and academic success; they also support propositions about the power of collective efficacy and human agency that are formulated by Sampson and his colleagues (Sampson & Raudenbush, 1999, Sampson, Raudenbush, & Earls, 1997). It seems that African Americans (both parents and children) are not as affected by the characteristics of a disadvantaged neighborhood as other social groups. In addition, students who live in disadvantaged neighborhoods are particularly helped if their parents maintain frequent communication with them, supervise their activities, and provide extra learning opportunities. These findings actually clarify the relationship between academic communication with the child, parental supervision of the child's activities, and academic achievement. These two parental practices may be adopted for different reasons, depending on the family's social context. In advantaged neighborhoods, parents may increase their communication with their child and their child supervision when the child is facing academic problems. In disadvantaged neighborhoods, these parental practices may constitute strategies that parents use to counteract the negative influences of the external environment and promote the academic success of their child.

Finally, we do not find evidence that school characteristics influence mathematics achievement indirectly through possible effects on parental activities. Schools tend to influence mathematics achievement directly, due to characteristics of their social organization. Schools with high proportions of economically disadvantaged students and schools facing attendance problems tend to have lower levels of student achievement in mathematics. Thus, the types of schools that are often found in disadvantaged neighborhoods add their own risks to students' academic success; they are distinct from the risks associated with the neighborhood's social context.

SUMMARY AND CONCLUSIONS

We began our investigation for this report in response to W.J. Wilson's challenge to social scientists for developing new research frameworks that explore the relationship between educational outcomes and the "social structure of inequality" (Wilson, 1998, p. 503). Based on recent research which begins to unravel the mechanisms by which the quality of neighborhood life "matters," we sought to examine whether the characteristics of disadvantaged neighborhoods and their schools may place adolescents at risk. We used data from the National Educational Longitudinal Study (NELS:88) and combined it with U.S. census data at the level of students' residential zip codes to explore such possibilities.

Our work uses a theoretical framework which considers family, neighborhood, and school as overlapping spheres that influence parental practices and students' academic success (Epstein, 1992). According to this framework, parents engage in different types of practices that utilize resources in each of the three spheres of life in order to help their children succeed in school. We therefore considered the joint and overlapping effects of family, neighborhood, and school on students' mathematics achievement in the eighth grade. Following the literature of neighborhood effects, we expected that neighborhoods and their schools may influence academic achievement directly and indirectly though their influence on family life.

Our data analyses support our expectations of a dual process of educational influence operating primarily at the neighborhood level. Our findings suggest (a) that neighborhoods characterized by concentrated disadvantage and schools characterized by student poverty and absenteeism tend to depress student's achievement in mathematics, and (b) that characteristics of disadvantaged neighborhoods tend to influence mathematics achievement indirectly, by depressing parental practices associated with high mathematics achievement. The social context of these neighborhoods may depress parents' abilities to engage in effective parental practices and may also foster social contexts that are not supportive of academic pursuits for adolescents. We conclude that place of residence may have important consequences for the academic success and the resulting life chances of adolescents. Place of residence may affect minority students the most, because they are concentrated in inner-city, disadvantaged neighborhoods (Massey & Denton, 1993).

However, in line with Sampson and Raudenbush's (1999) thesis of collective efficacy, we also found evidence of the importance of human agency. Our results show that parents, to a certain extent, can help students overcome the educational disadvantages of their environment by having frequent communication with them, closely monitoring their activities, and providing them with extra learning opportunities. Thus, although the life chances of minority and poor adolescents are negatively affected by the characteristics of their neighborhoods, some of these disadvantages may be offset by family and parenting practices.

Recent methodological developments, such as the Hierarchical Linear Models, and new methods of data collection, such as systematic social observation, now allow for more complete investigations of interrelationships between social context and individual behaviors. We hope that future major data collection efforts take into consideration these new developments so that they can fully explore the interactive effects of neighborhoods, families, and schools on the life chances of adolescents.

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NOTES

[1] In another project, where both zip codes and tract codes were available, Beveridge has found that though the effects for zip codes are slightly less for a given relationship than census tracts, the relationships are roughly the same (Beveridge, Ng, & Weber, 1997).

[2] Data analyses use the appropriate sampling weight (BYQWT) (see Ingels et al., 1992). The weight is divided by its mean in order to obtain the appropriate sample size for significance testing.

[3] We present analyses on mathematics achievement only; we have also conducted analyses on reading achievement with similar results.

[4] This index is constructed by the NCES by combining parent's education, occupational prestige, income, and a series of material possessions at home (see Ingels et al., 1992).

[5] We created different versions of the neighborhood disadvantage index, by using only the five "Ricketts and Sawhill" variables, by using all eight variables, and by using various other combinations of variables. We ran our multivariate models by using these different indices and found that they all produced very similar parameters.

[6] All multi-level models are estimated using the REML estimation method of the PROC MIXED procedure in SAS. Where there were missing data, we used mean substitution based upon the results for those students in the same school and the same zip code.

[7] For 51 of 2540 zip codes, students attended more than one school. In these situations, we still treated the zip codes as nested within the schools. Such cases are magnet schools in urban areas. We ran our analyses eliminating these cases; since they had virtually no effects on our models, we decided to leave them in our sample.

[8] For a detailed discussion of how variance parameters and ratios are calculated in SAS, see Singer, 1998.

[9] We recognize that neighborhood variation in our dependent variables is small. However, we feel that this research question is worth exploring further. Our research findings show a consistent pattern of variation, which is in line with existing theory and research. Moreover, the NELS data set is one of the few sources of data with adequate neighborhood variation to explore the possibility of neighborhood effects.

[10] Preliminary models tested for additional interaction terms between our neighborhood disadvantage index and individual-level variables. The models presented here include only those interaction terms that yield statistically significant results.

[11] The effects of all variables in the model, except for the variances at levels 2 and 3 are fixed; their slopes are not allowed to vary by neighborhood or school. All independent variables in the model are standardized to a mean of zero and a standard deviation of 1. The dependent variable is standardized to a mean of 50 and a standard deviation of 10.

Appendix A

Number, Mean, Standard Deviation, and Minimum and Maximum for All Variables (Unstandardized)

Variable	*N*	*Mean*	*Std Dev*	*Minimum*	*Maximum*
Dependent Variable					
Mathematics Achievement	18310	49.59	10.54	33.90	77.20
Family and Student Variables					
Sex (Male=1)	19072	0.50	0.53	0.00	1.00
African American (African Amer.=1)	18805	0.14	0.37	0.00	1.00
Latino (Latino=1)	18805	0.10	0.32	0.00	1.00
Mom Works Full-Time	17271	0.52	0.53	0.00	1.00
Socio-Economic Composite	19062	-0.18	0.80	-2.97	1.91
Academic Engagement	17730	9.67	2.26	3.00	12.00
Skips School	17853	1.51	1.65	0.00	9.00
Parental Involvement Variables					
Expectation of Further Education	17737	8.41	3.03	1.00	12.00
Academic Communication	17403	10.28	1.75	3.00	12.00
Academic/Behavioral Supervision	17182	2.55	0.79	0.00	3.00
Communication with School	16494	5.98	2.22	4.00	16.00
Participation in PTO	17008	0.82	1.12	0.00	3.00
Music/Dance Lessons	16305	0.37	0.65	0.00	2.00
Museum Visits	16521	1.39	1.34	0.00	3.00
Neighborhood Variables					
Neighborhood Disadvantage	18332	433.19	162.96	60.00	783.00
Percent African American	18363	11.82	22.19	0	99.39
Percent Latino	18363	8.70	18.80	0	98.53
School Variables					
Student Teacher Ratio	19072	17.26	4.35	6.00	34.00
% Free or Reduced Fee Lunch	18987	26.96	24.67	0.00	100.00
> 40% Minority	18988	27.70	33.10	0.00	100.00
School Enrollment	19072	3.73	1.52	1.00	6.00
Urbanicity	19072	2.13	0.78	1.00	3.00
School Attendance Problems	18984	8.83	1.89	3.00	12.00
School Violence Problems	18986	23.68	3.03	7.00	28.00
Academic Press	19002	16.33	2.71	4.00	20.00

CRESPAR

Johns Hopkins University
Center for Social Organization of Schools
3003 North Charles Street – Suite 200
Baltimore MD 21218
410-516-8800 / 410-516-8890 fax

Howard University
2900 Van Ness Street, NW
Washington DC 20008
202-806-8484 / 202-806-8498 fax

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